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Noisy Winter: The DDT Controversy in the Years before *Silent Spring*

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ABSTRACT In this paper, we examine three unanticipated findings from a social constructionist analysis of popular media coverage of the pesticide DDT from the years 1944 to 1961. The first unanticipated finding was the early (1945) appearance of negative or cautionary claims in the media source examined, the *New York Times*. Second, while negative or cautionary claims about the pesticide did constitute a minority voice during this time period, it was nonetheless a persistent voice. The third unanticipated finding was the predominance of the U.S. Department of Agriculture and the State Agricultural Experiment Stations among those claimsmakers initially cautioning potential users about unintended and potentially deleterious impacts. The concept of "routine monitoring mechanisms" is introduced to explain this third finding. We conclude by considering the potential impact of this coverage on the subsequent development of the controversy.

Introduction

A quintessential feature of the 20th century is the prodigious development of advanced technologies, developments that have presented society with enormous benefits as well as substantial risks. The Janus-faced nature of such technologies as nuclear energy, synthetic chemicals, and bio-engineered organisms has created policy challenges as scientists and government officials struggle to determine risks and to weigh these against expected benefits (Eisenbud 1978; Goldstein 1990). Furthermore, such determinations frequently occur in, and indeed are spurred by, charged political environments where social movement activity and media coverage have problematized public acceptance of the technology in question (Nelkin 1992).

A key event in the life cycle of a technological controversy is thus the initial emergence, and subsequent expansion, of negative media coverage of the technology (Baumgartner and Jones 1993; Hannigan 1995). In the present paper we examine negative coverage of the pesticide DDT from 1944, the first year the popular media reported on the pesticide, to 1961, the year preceding the publication of *Silent Spring*, Rachel Carson's highly influential indictment of synthetic organic pesticides such as DDT (Garb 1996; Goldstein 1990; Van Emden and Peakall 1996). The empirical questions we assess are derived from social constructionist approaches to social problems (Holstein and Miller 1993; Schneider 1985; Spector and

Kitsuse 1977), and these questions focus on claimsmakers and on the nature of their claims (Best 1989; Hajer 1995). Grounded theory techniques (Altheide 1987, 1996; Charmaz 1983; Glaser and Strauss 1967) are utilized to locate these descriptive findings within a broader area of concern, namely the way in which technological risks comes to be entered onto political, public, and media agendas (Kingdon 1984).

In this paper, we examine three unanticipated findings from our media analysis. First was the early (1945) appearance of negative or cautionary claims in the media source examined, the *New York Times*. Second, while negative or cautionary claims about the pesticide did constitute a minority voice during this time period, it was nonetheless a persistent voice. The third unanticipated finding was the predominance of the U.S. Department of Agriculture (USDA) and the State Agricultural Experiment Stations (SAES) among those claimsmakers initially cautioning potential users about unintended and potentially deleterious impacts. These findings were unanticipated, given (1) the frequent celebration of Carson's *Silent Spring* as the landmark work that enlightened the public about the possible dangers of pesticides and served to turn the tide of public opinion against their unrestrained use (Graham 1970; Hynes 1989; Lear 1993; Lutts 1985; *Newsweek* 1994), and (2) the general portrayal of the USDA and the SAES by pesticide critics as major culprits in, and promoters of, detrimental pesticide practices (Carson 1962; Hynes 1989; van den Bosch 1978).

In the following section, we discuss the methods utilized in this study. We follow this with a description of *New York Times*' coverage of DDT in the years 1944–1961, with a particular focus on negative claims and their various claimsmakers. Next, we direct a more focused analysis to the role of the USDA and the SAES in the controversy. We set ourselves a modest theoretical goal in this paper, introducing the concept of "routinized monitoring mechanisms" to explain why the USDA and the SAES were among the earliest claimsmakers to sound a cautionary note about potential detrimental impacts from DDT use. Exploring the implications of the first two findings entails an extended discussion of the theory of the state in technological controversies; we undertake this exploration in Gunter, Harris, and McMillan (1997). We conclude by considering the potential impact of this coverage on the subsequent development of the controversy, as well as the implications of our findings for our understandings of this particular controversy and technological controversies more generally.

Methods

The analysis reported in this paper is based on historical research utilizing secondary source material (Shafer 1980; Stewart 1984). As one would anticipate with an historic event of the magnitude of

the DDT controversy, a considerable volume of scholarly work has already been done on this topic (Blodgett 1974; Bosso 1987; Dunlap 1976, 1978, 1981; Graham 1970; Hynes 1989; Lear 1993; Perkins 1978; van den Bosch 1978). In the present study, information contained in these sources is used in conjunction with original research on the 228 articles on DDT published in the *New York Times* between 1944 and 1961.

We chose the *New York Times* as our popular media source for both substantive and pragmatic reasons. Substantively, the *New York Times* is listed among the country's most important news sources, and it is considered by Hulteng and Nelson (1971) to be the nation's highest-quality newspaper in the time period under study. Both Gans (1979) and Mazur (1991) regard the *New York Times* as the premier agenda setter among the nation's major news media (including weekly newsmagazines and national television news broadcasts), with stories frequently breaking first in the *New York Times*, then subsequently being picked up by other news outlets. Pragmatically, indexes and microfiche copies of the paper mean that articles from this period are both identifiable and readily accessible for analysis. Furthermore, the fact that the *New York Times* is a daily publication greatly increases the likelihood that sufficient articles will be available on a topic to permit meaningful analysis. For example, 228 articles on DDT were published in the *New York Times* between 1944 and 1961. The combined number of articles published on pesticides as a whole (which includes articles on DDT) in all three of the major newsweeklies (*Newsweek*, *Time*, and *U.S. News and World Report*) over this same period was 43, and almost half of these appeared in 1944 and 1945, the first two years of coverage.

Our analysis of the *New York Times* was a constructionist one, focusing on claimsmakers and their claims (Best 1989; Gamson and Modigliani 1989). It was developed through the use of ethnographic content analysis (Altheide 1987, 1996), which applies the more inductively-oriented, emergent, and iterative techniques of grounded theory (Charmaz 1983; Glaser and Strauss 1967; Strauss and Corbin 1990) to documentary material. In contrast to the more linear trajectory presented by hypothetico-deductive approaches (Chafetz 1978), ethnographic content analysis requires continual movement between data gathering, data analysis, and conceptualization/theory development (Hajer 1995), thus allowing researchers the opportunity to do detailed and extensive checks on coding accuracy.

For a study of this kind to move beyond the level of sheer description requires the grouping of specific claims, such as "DDT increases potato crop," into more inclusive conceptual categories. In the present study, claims made about DDT use in the pre-*Silent Spring* era are grouped according to whether they highlight potential benefits or potential risks. This particular categorization of

claims was utilized for two reasons. First, technological controversies are marked by disagreements over the nature and magnitude of risks and benefits. Increased media, government, and public attention to risks are indicators of heightened conflict, while shifts between primary foci on risks or benefits are seen to mark key stages in the life cycles of these events (Baumgartner and Jones 1993; Jasper 1988). Second, this classification scheme resonated with the concrete claims we identified in the *New York Times*, thus conforming to a basic precept of grounded theory that conceptual development retain the integrity of the investigated phenomenon (Glaser and Strauss 1967).

Baumgartner and Jones (1993:51) classify benefits and risks by asking, "If we were industry leaders, would we be pleased or unhappy to see such a claim in print?" From the industry's perspective, "benefits" convey positive messages about the technology and "risks" convey negative messages. In the present analysis, we follow this lead, with the caveat that accurate portrayal of DDT risk claims during the period requires the joint designation of "negative or cautionary claim." This qualification is necessary, given that many of the claimsmakers raising risk concerns, the USDA and the SAES chief among them, are not making sweeping indictments against DDT, which the sole term "negative" might suggest. In many cases, claimsmakers are warning that there is some good reason to believe that the pesticide *may* produce detrimental impacts, either universally or in certain circumstances of improper use.

While this terminology is awkward, it is necessary to retain the dualistic nature of claims in terms of (1) the message the claimsmaker actually meant to convey, versus (2) the possible appropriation of those claims by others. As we explain further in the conclusions, the pertinent point in terms of the subsequent controversy development is that, prior to the publication of *Silent Spring*, the public had over a decade and a half of at least some exposure to claims about DDT that *could be read as negative*, regardless of whether this was the reading intended by the original claimant. The need to make this joint designation also suggests that claims about hazardous technologies may often be more complex than simple dichotomies between "risks" and "benefits," a point developed further in the conclusions of the paper.

Findings

New York Times' *coverage of DDT, 1944–1961*

While the insecticidal capabilities of DDT were discovered in Switzerland in 1939 (Perkins 1978), the pesticide did not become a news item in the U.S. until 1944. Even then, the pesticide's initial newsworthiness occurred within the context of the major news story of the time—the Second World War. The ravages of war are

many, among them devastations wrought by such insect-borne diseases as typhus and malaria. At the start of the war, there were not readily available pesticides capable of effectively fighting the vectors of these diseases. DDT promised to change that. With its low acute mammalian toxicity, long persistence, broad-spectrum action, and low production costs, DDT was a compound seemingly well suited to the large-scale treatment of civilian populations and vector breeding grounds necessitated by war-time conditions (Perkins 1978).

It was not only because the chemical fit well with the technological optimism characteristic of those times that DDT was so attractive a news item (see Gamson and Modigliani 1989). More generally, DDT sent optimistic messages about the war—about the U.S. capacity to win the war, about the probability of soldiers surviving to see the end of the war, and about American ingenuity in general —messages that are scarce and valued commodities in such troubled times. Thus, it is hardly surprising to find a high rate of favorable coverage of DDT over this time period. Of the 96 articles on DDT published in the *New York Times* during the first three years of coverage (1944–1946), almost three-fourths (73 percent) contained only positive claims about the pesticide, that is, claims about benefits of the pesticide such as protection from insect-borne diseases. Fifty-five percent of the 228 articles published over the period 1944–1961 contained only positive claims. Examples of the kinds of positive claims being disseminated in the *New York Times* over this time period are reflected in the headlines shown in Figure 1.

While predominantly positive, the coverage of DDT by the *New York Times* in the pre-*Silent Spring* years was not exclusively so. Indeed, almost one-fourth (24 percent) of the articles on DDT published in this paper between 1944 and 1961 were largely or wholly devoted to the potential risks associated with the pesticide's use. Furthermore, the ratio of positive to negative coverage declined markedly over this time period (see Table 1). As can be seen in Figure 2, there were two peak periods of negative or cautionary coverage of DDT in the *New York Times* (1945–1949 and 1955–1958) and two periods of limited coverage (1950–1954 and 1959–1961). The first peak corresponded to the extensive coverage given DDT in the years during and immediately following its use in the war effort. Most of the articles published during the second peak of negative coverage (1955–1958) were related to protests over the USDA's "eradication" campaign against the gypsy moth which was conducted by aerial spraying of millions of acres of Northeastern forests (Bosso 1987; Dunlap 1981). This particular periodization is used to report findings in several tables included in this section.

Figure 2 also reports the number of negative or cautionary claims published in the *New York Times* between 1945 and 1961. The strategy used to count negative or cautionary claims is explained in greater detail below, but this strategy focuses on types of negative

Figure 1. Examples of *New York Times'* Headlines Portraying Positive Claims About DDT, 1944–1945

"Science in Review: DDT, the Army's Insecticide Powder, Strikes a Blow against Typhus and for Pest Control" (6-4-44:E9)
"The Conquest of Typhus" (6-4-44:E8)
"Saipan Cleansed: Airplanes Spray Island with DDT, Killing Every Insect" (12-3-44:IV E9, 7)
"DDT Repels Barnacles" (7-17-45:24)
"Long Island Beaches Rid of Insects by DDT" (7-25-45:23)
"Flies on Mackinac Island Extinguished with DDT" (8-10-45:10)
"DDT Mixed in Wall Paint Keeps Flies from Rooms" (8-24-45:21)
"Chemists Say DDT Could Save 1 to 2 Million Lives Each Year" (8-29-45:25)
"DDT Increases Potato Crop" (12-5-45:22)

or cautionary claims raised by particular claimsmakers. Since some articles reported negative or cautionary claims by several different claimsmarkers, or several different types of negative or cautionary claims raised by a single claimsmaker, the total number of negative claims recorded in the two latter periods (1955–1958 and 1959–1961) was higher than the number of published articles. This coincides with the findings of the declining ratio of positive to negative coverage reported in Table 1.

The first *New York Times* article (May 6, 1945:35) to carry negative claims about DDT, "Woman Advances Wildlife Studies: Scientists in Federal Service Report Gains in Knowledge of Fish, Birds, and Diet," reported on findings by a United States Fish and Wildlife Service (hereafter USF&WS) biologist, Lucille Stickel. She reported that DDT had an "extremely toxic" effect on fish and other aquatic life when applied to stagnant waters in order to kill mosquitoes. Examples of other negative headlines on DDT published in the *New York Times* between 1945 and 1958 are provided in Figure 3. Below, we analyze the themes contained in these headlines and in the articles they headed.

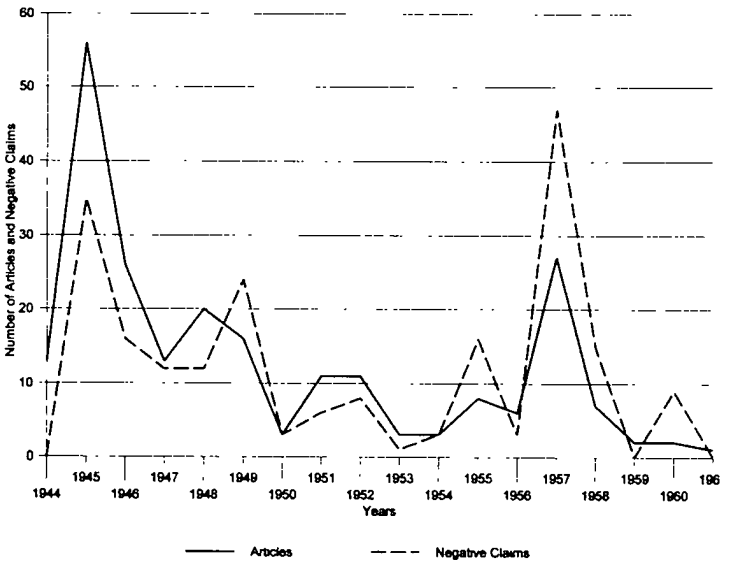
A more detailed analysis of the negative or cautionary claims about DDT appearing in the text of *New York Times'* articles is pro-

Table 1. Ratio of *New York Times'* articles portraying exclusively or primarily positive claims about DDT to *New York Times'* articles portraying exclusively or primarily negative/cautionary claims about DDT, 1944–1961

Years*	Ratio
1944–1949	4.9 to 1
1950–1954	2.3 to 1
1955–1958	1.4 to 1
1959–1961	1.5 to 1

* For explanation of periodization, see Figure 2.

Figure 2. Temporal distribution of articles on, and negative/cautionary claims about, DDT published in the New York Times, 1944–1961



vided in Table 2. There are three important points to note from this table. The first is the range of concerns about DDT raised in the *New York Times* over this time period. These concerns include human health impacts, wildlife and other environmental impacts, and soil and plant impacts, as well as concerns about the short and long-term efficaciousness of the pesticide. Table 2 reports 16 categories of such impacts, developed through the inductive coding techniques of ethnographic content analysis (Altheide 1987, 1996); thus, they are intended to reflect, as closely as possible, the actual language expressed in the *New York Times.*

For example, claims were only coded as "upsets balance of nature" when that particular language was used, even though other categories reported in this table (such as "direct poisoning/destruction of wildlife," "kills insect predators and parasites," and "reproductive failures") could logically have been subsumed under this more general heading. In generating this coding scheme, we opted for fine detail rather than parsimony, developing categories that distinguished claims on the basis of different routes of impact, more concretely specified routes of impact, and/or different impacts, rather than grouping claims into more inclusive categories (e.g., health impacts, wildlife impacts). This fine-detailed coding

Figure 3. Examples of *New York Times'* headlines portraying negative/cautionary coverage of DDT, 1945–1958

"Dangers Inherent in DDT" (8-3-45:16)
"Fish Killed by DDT in Mosquito Tests" (8-9-45:23)
"They Still Buzz in: Mosquitoes Invade Jersey Homes and Offices Despite DDT" (8-10-45:17)
"Care Urged in DDT Use: Botanic Garden Head Says It May Destroy Bees" (9-20-45:25)
"DDT Spray Called Injurious to Birds — Experts Warn Insecticide May Be Fatal to Fish—Further Tests Urged" (19-23-45:10)
"Man Killed by DDT Fumes" (8-26-46:25)
"Farmers Warned on DDT: Expert Says It Appears in Milk, Meat after Crop Dusting" (5-25-47:52)
"Bird Deaths Start Insecticide Tests: Audubon Society Sprays Areas to Determine Which Solutions Spare Feathered Life" (7-5-48:17)
"DDT-Resisting Flies Call on Many Areas in Sicily" (7-8-48:3)
"Doctors to Study DDT as a Food Poison" (3-3-49:53)
"Public Warned on DDT" (3-10-51:11)
"DDT Called Dangerous" (11-24-51:12)
"Long Islanders Ask Court to Halt DDT War on Moth as Health Risk" (5-9-57:1)
"Witness Believes DDT in City Food" (9-13-57:25)
"DDT Spray Called Cancer Menace" (2-14-58:25)

was used on the assumption that laypeople's alarm over negative impacts of pesticide use increases as they are confronted with more numerous, diverse, and varied routes by which such impacts might occur, as well as by targets of such impacts.

Table 2 also provides further indication of the early appearance of negative or cautionary claims about DDT in this particular news source. Of the 16 problem categories identified in Table 2, fully half first appeared in 1945 (only one year after the *New York Times'* initial coverage of DDT), while 81 percent had appeared in print by the end of 1947. This table also provides information on the frequency of negative or cautionary claims over the period 1945–1961. Totals for each of the 16 concern categories were derived by tallying the number of different claimsmakers who expressed that concern in a given article. In other words, if representatives from the USDA were quoted three times in a given article as cautioning that DDT use might upset the balance of nature, that would be counted as one occurrence of that claim rather than three. On the other hand, if that concern was expressed in the same article by both the USDA and the USF&WS, then two occurrences of that concern would be counted.

This counting scheme yielded a total of 210 negative or cautionary claims about DDT printed in the *New York Times* between 1945 and 1961. While this number is not exorbitantly high, it must be recalled that the total number of articles on DDT printed in the *New York Times* (228) over this time period is only slightly higher. If these

Table 2. New York Times' coverage of negative/cautionary claims about DDT, 1945–1961

Claim	Year first appeared	Initial claimsmaker	Total 1945–1961
Direct poisoning/destruction of wildlife	1945	USF&WS	46
Upsets balance of nature	1945	USDA	11
Kills, or is harmful to, beneficial insects (excluding parasites and predators)	1945	USDA	14
Kills insect parasites and predators	1945	Letter to the editor	13
Residues on plants and food	1945	FDA	16
Potentially harmful to people	1945	Letter to the editor	29
Not efficacious	1945	Unknown	4
Accumulates in soils	1945	USDA	8
Injurious to some plants	1945	USDA	10
Indirect destruction of fish and wildlife through the food chain	1946	USF&WS	5
Contamination of milk	1946	Private Industry Scientist	19
Contamination of meat	1947	USDA	5
Insect resistance	1948	Italian Public Health Official	25
Accumulates in body fat	1950	FDA	3
Carcinogenic	1958	Medical Personnel/FDA	1
Reproductive failure	1960	Supreme Court Justice	1
Total			210

negative claims had been distributed evenly across all DDT-related articles, they would have come close to averaging one per article.

A third important element to note from Table 2 is the frequency of the USDA among those initially making negative or cautionary claims. Out of the 16 problem areas identified in this table, the USDA constituted the initial claimsmaker for almost one-third (31 percent). Below, we suggest some reasons for this finding.

Table 3 provides additional information on the credibility of the claimsmakers raising negative or cautionary claims about DDT over this time period. This table was constructed by taking the 210 negative or cautionary claims identified through our ethnographic content analysis and distributing them across claimsmakers, rather than across concern categories, as was done in Table 2. The only claimsmakers listed separately in Table 3 are ones that comprised at least four percent of total claims (see final column, Table 3); all other claimsmakers are lumped in the "other" category. These "others" include the U.S. Department of Health, Education and Welfare and the Food and Drug Administration (USHEW/FDA), the U.S. Public Health Service (USPHS), the U.S. Department of Interior/Fish and Wildlife Service (USDI/FWS), the Armed Forces, Supreme Court Justices, state governments, local governments, uni-

Table 3. Frequency distribution of claimsmakers raising negative or cautious claims about DDT in the *New York Times,* 1945–1961

	1945–1949		1950–1954		1955–1958		1959–1961		Total	
Claimsmaker	N	%	N	%	N	%	N	%	N	%
USDA	32	32.3	3	14.3					35	16.7
SAES	9	9.1							9	4.3
Museums/ botanical gardens	3	3.0			17	21.0			20	9.5
Medical/AMA	7	7.1	6	28.6	3	3.7			16	7.6
Environmental organization	11	11.1			3	3.7			14	6.7
Residents, gypsy moth campaign					25	30.9	2	22.2	27	12.9
Letter to the editor	6	6.1			4	4.9			10	4.8
Unknown	11	11.1	1	4.8	15	18.5			27	12.9
Other	20	20.2	11	52.4	14	17.3	7	77.8	52	24.7
Total	99	100.0	21	100.1	81	100.0	9	100.0	210	100.1
Percent of total		47.1		10.0		38.6		4.3		
Total NYT articles	132		30		48		5		215	

versity scientists, scientific associations, private industry scientists, chemical industry representatives, *New York Times'* editorials, and international claimsmakers (Gunter 1994).[1] An unfortunate outcome of collapsing categories in this way is that almost one-fourth of the 210 negative or cautionary concerns examined in Table 4 are attributed to "other" claimsmakers. Still, given the limited contribution of individual claimsmakers in this category, for purposes of our analysis such collapsing is justified.

[1] Both the U.S. Public Health Service and the Food and Drug Administration had been conducting studies on health impacts of pesticide exposure for several decades prior to the introduction of DDT (Whorton 1974). The USPHS favored epidemiological studies of highly-exposed individuals; their research was designed to identify acute but not chronic impacts (DDT has low acute mammalian toxicity). The FDA favored toxicological studies that would allow assessments of chronic impacts. By the mid-1940s, the FDA had conducted studies that suggested worrisome potentials for DDT to accumulate in body fat, thus presenting the possibility of latent impacts. It is difficult to provide conclusive or convincing evidence for these kinds of impacts, however, particularly given the generally skeptical milieu of the times (Perkins 1978). It was only after the introduction of the synthetic organics that large areas of forests, swamps, and rangelands came to be treated with pesticides. Prior to this, the U.S. Fish and Wildlife Service had no compelling reason to monitor pesticide impacts on wildlife (Dunlap 1981). Hence, of the major federal agencies involved in pesticide research in the post-World War II era, only the USDA was well-positioned to engage in routinized monitoring of DDT.

When we examine the 99 negative or cautionary claims made about DDT during the first peak of negative coverage (1945–1949), we see that almost one-third (32 percent) were attributed to the USDA. If we include with the USDA the closely-aligned state agricultural experiment stations (SAES), that number increases to 41 percent. By the second peak of negative coverage (1955–1958), virtually all of the claimsmakers raising negative or cautionary claims were non-governmental. The two major categories of claimsmakers active at this time include residents living in the area of the gypsy moth campaign, and museums and botanical gardens. The prevalence of this latter category was also connected with the gypsy moth campaign, particularly in the person of Robert Cushion Murphy, a naturalist employed by a botanical garden and one of the most vocal critics of the gypsy moth campaign.

Routinized monitoring mechanisms in the agenda setting process

In the previous section, we demonstrated both that a diverse range of negative or cautionary claims about DDT appeared very early in the *New York Times*' coverage of that pesticide, and that the claimsmakers responsible for a substantial percentage of those early negative or cautionary claims were the USDA and the SAES. In this section, we use a concept developed from Kingdon's (1984) work on agenda setting, that of routinized monitoring mechanisms, to explain this latter finding.

In examining the process by which particular conditions (or alleged conditions) come to be defined as social problems (Best 1989; Holstein and Miller 1993; Schneider 1985; Spector and Kitsuse 1977), it must be kept in mind that there are numerous locales from which claims about problematic conditions may originate, and researchers working in this perspective are well-advised to stay alert for novel claimsmaking activity. However, allowing room in our theoretical frameworks for unanticipated or creative responses does not preclude the inclusion of more patterned or institutionalized forms of behavior (see Giddens 1987). While concerns about a problematic condition might theoretically originate almost anywhere, in actuality there are some organizational types that have a persistent presence in this sphere of activity. Foremost among these are social movement organizations and political interest groups, and government regulatory and social welfare agencies (Solecki and Shelley 1996). It is not surprising that social movement organizations and political interest groups are in the forefront of claimsmaking; indeed, it is their raison d'etre (Morrison forthcoming). More surprising is the prominence of government agencies, organizations we usually think of as more interested in the defense of the status quo (Schnaiberg 1980). For this reason, in this section of the paper, we focus on the factors which may lead government agencies to be in such a prominent position.

The reason government agencies may be among the first to compile data suggestive of an existing, emerging, or threatening problematic condition stems from the specialized activities performed by those agencies. Government agencies are created to implement policies in specialized domains (e.g., food and drug safety, public health, equal opportunity, education); an integral part of carrying out this mandate is to engage in ongoing monitoring of the state of these domains. While Kingdon (1984) himself does not use this particular terminology, we find it useful to group this set of activities under a conceptual label: "routinized monitoring mechanisms."

One form such routinized monitoring mechanisms may assume is the gathering and/or compilation of a variety of economic, social, public health, and environmental indicators (Duncan 1984; Scott et al. 1996). Increases in unemployment rates, teenage pregnancy rates, cardiac diseases, or atmospheric lead may be interpreted as signals of nascent problematic conditions, either by the compiling agency or by others who have access to this information. Various types of government regulatory activities can also be subsumed under the rubric of routinized monitoring mechanisms. For example, a wide range of consumer products, among them food additives, drugs, and pesticides, can only be marketed after data on their safety and efficacy has been submitted to, and cleared by, the appropriate government agency (Epstein and Grundy 1974). Government agencies may also monitor their own, or another agency's, programs. For instance, when the USDA undertook an extensive campaign against the gypsy moth in the late 1950s, engaging in aerial spraying of millions of acres of forests in the northeastern United States, the impact of that program on wildlife was monitored by the USF&WS (Dunlap 1981).

What is theoretically interesting about routinized monitoring mechanisms is that they lead to outcomes contrary to those other theories would expect. In general, sociological theories of the state (*cf.* O'Connor 1973) emphasize the role of the state in legitimating the current social formation. Within the context of controversies concerning technology and the environment (Buttel 1985), this is usually taken to imply that the state will ratify the beneficial nature of the technology in order to enhance the accumulation of capital by the manufacturers and users of the technology. That the state institutionalizes routine monitoring mechanisms which would seem, given the Janus-faced nature of these technologies, to have at least 50:50 odds of revealing information detrimental to the acceptance of a particular technology seems contrary to this theoretical perspective. It could be argued that the state institutionalizes routine monitoring mechanisms as a way of foreseeing technological disasters that would threaten legitimacy and accumulation.

With these theoretical perspectives in mind, we turn now to a

consideration of the USDA's role in pesticide development, regulation, and policy. A variety of government agencies have had involvement with pesticide research and development, regulation, and deployment, including the Armed Forces, the U.S. Public Health Service, the Food and Drug Administration, and the Interior Department (Blodgett 1974). However, the federal agency with the longest history of involvement in the pesticide arena is the USDA. Development of new, and improvement of existing, pest control techniques was a major research focus of the USDA and the closely aligned SAES and land grant colleges by the late 19th century (Whorton 1974). The agency assumed some limited regulatory functions in the early 20th century with the passage of the 1910 Federal Insecticide Act (Bosso 1987). A "truth in advertising" law, the FIA, required pesticide manufacturers to register product labels with the USDA (Dunlap 1978). This law was revised in 1947 in the form of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), which required pre-market clearance of product labels, and it also required that manufacturers submit data on efficacy and safety as a basis for product registration (Blodgett 1974; Bosso 1987).[2]

The USDA's research on, and regulation of, pesticides took place within the context of a broader pesticide subgovernment system that included farmers and farm organizations, Congressional patrons of agriculture, and pesticide manufacturers (Bosso 1987; Hansen 1991; Van den Bosch 1978). While the interests of these participants did not always coincide, they did all share a commitment to what Bosso has referred to as the "pesticide paradigm," that is, the belief that pesticides were absolutely necessary for modern agriculture and, if used properly, were perfectly safe. The role the USDA was to play on the pesticide front was clear to the members of this subgovernment system: they were to facilitate farmers' access to better pest control technology.

This role has placed the USDA as a key promoter and defender of pesticides, activities that have resulted in the agency being a major target of pesticide critiques (Carson 1962; Hynes 1989; van den Bosch 1978). It might seem, at first glance, that the agency's role as "pesticide defender" is totally at odds with its level of dissemination of cautionary claims about DDT in the *New York Times* in the latter years of the 1940s. We argue, however, that these appear irreconcil-

[2] FIFRA resulted in a slight increase in bureaucratic power for the USDA, the result of the chemically-complex and unfamiliar formulas that constituted pesticide ingredients in the post-World War II era. However, both FIA and FIFRA were "truth in labeling" laws; as such, the USDA's regulatory power under both was quite minimal. For example, a provision in FIFRA allowed pesticide manufacturers to market pesticides denied registration by the USDA "under protest" (Blodgett 1974; Bosso 1987). This law thus had more of a symbolic than a substantive impact.

able only if one starts from the assumption that the USDA and the SAES were such stalwart defenders of pesticides that they admitted no possibility of negative or unintended side effects of pesticide use, and that they were homogeneous and unitary in their behavior. Such assumptions can be challenged on theoretical, empirical, and pragmatic grounds.

Theoretically, this view of the role of the state assumes an instrumentalist perspective, wherein the state operates for the benefit of one class interest within society or for the benefit of the capitalist social order in a more abstract sense (Buttel 1985). In another paper (Gunter, Harris, and McMillan 1997), we suggest that (1) state agencies are not monolithic entities but rather embody diverse interests, and (2) that state agencies and the actors within them have interests which may influence agency activity. Since we explore this argument in more detail elsewhere, we will not elaborate upon it here.

Empirically, it can be documented that experiments designed to reveal a variety of unintended side effects of pesticide use were being conducted by agricultural scientists in the USDA, SAES, and land grant colleges by the early 20th century. The class of pesticides most widely used during this time period was the natural inorganics (Whorton 1974), a situation that persisted until the waning years of WWII when the shift was made to the synthetic organics such as DDT (Perkins 1978). Agricultural scientists knew that the heavy metals contained in such natural inorganic pesticides as lead arsenate and copper sulfate were not innocuous substances. Misused, these substances could accumulate in soils and eventually render those soils infertile (Maquenne and Demoussy 1921; McGeorge 1915), damage plants (Cook 1921; Stewart 1922), kill bees (Holland 1916; Morse 1919), accumulate in food products (Hahn 1922; Treuthardt 1916) and, in large enough quantities, poison livestock and humans (Green and Dijkman 1921; Kingsley 1920).[3]

Pragmatically, protecting and furthering farmers' interests also demanded that the USDA take account of these kinds of unintended side effects of pesticide use, as well as develop and disseminate strategies of use designed to avoid or mitigate such side effects. It did farmers little good to destroy the pests attacking their crop one year if they rendered their soil unfit for future use in the process.

Thus, agricultural scientists in the USDA, SAES, and land grant colleges had institutionalized means to identify unintended side effects of pesticide use long before DDT came on the scene in the 1940s. DDT, like other pesticides that had gone before it, was subjected to these tests; the results demonstrated the potential to

[3] Not all of these studies found reported impacts within the parameters of the particular experimental designs that were utilized. However, they do provide indications of the potential kinds of impacts agricultural scientists routinely took into account.

wreak unintentional harms, such as the ones listed in Table 2. From the USDA's perspective, documenting deleterious side effects and disseminating warnings of those to potential users (consumers as well as farmers) were both far from remarkable activities. That cautionary claims about DDT use by the USDA and the SAES ceased to be disseminated through the *New York Times* following the emergence of controversy over the gypsy moth campaign in the mid-1950s (see Table 3) suggests the USDA may have been less enthusiastic about airing cautionary claims once it became apparent that these claims could be appropriated by pesticide critics (though it is also possible that these findings are at least partly the result of *New York Times* reporter and editorial decisions).

Conclusions

In this paper, we examined three unanticipated findings from a social constructionist analysis of *New York Times* coverage of the pesticide DDT between 1945 and 1961. These unanticipated findings were: 1) the early appearance of negative or cautionary claims; 2) the persistence of negative or cautionary claims over this period; and 3) the predominance of the U.S. Department of Agriculture and the State Agricultural Experiment Stations among those claims-makers initially cautioning potential users about DDT's unintended and potentially deleterious impacts. Empirically documenting these findings is an easier task than determining their relevance for our collective understandings of pesticide practices and controversies. We begin to address this issue by discussing our own foci of interest, that of political agenda setting (Dearing and Rogers 1996; Kingdon 1984). We next consider our findings in light of work on institutional failures (Freudenburg 1993). We conclude by drawing implications from our findings about the public's "irrational fears" regarding technological risks.

In what way, if any, did negative or cautionary coverage of DDT from the mid-1940s through the early 1960s facilitate placement of critical scrutiny of pesticides in a prominent place on the government agenda in the years immediately following the publication of Rachel Carson's *Silent Spring*? We consider the most likely impact of this coverage on the subsequent controversy development to be that of softening up the public, making them more receptive to Carson's claims. Kingdon (1984:137) offers the following assessment of the importance of softening up in the process of political agenda setting: "Softening up seems to be necessary before a [policy] is taken seriously. Many good proposals have fallen on deaf ears because they arrived before the general public, the specialized publics, or the policy community were ready to listen." If such phrases as "a new public issue" or "a changed interpretation of an existing condition" were substituted for "policy proposal," this quo-

tation would be equally applicable to media and public agendas (Dearing and Rogers 1996).

In the present case, we consider the most likely scenario to be a two-step softening up process, with initial exposure most extensively concentrated among the more privileged elements of United States society, particularly East Coast intellectual and policy elites. As some of these individuals became convinced that existing pesticide practices presented unacceptable risks, they engaged in activities that disseminated these concerns to a broader segment of the public. This seems a likely explanation of the opposition to the USDA gypsy moth campaign that developed, particularly in New York state, in the latter half of the 1950s. Consisting of a loose confederation of largely middle and upper-middle class homeowners whose property was located in or near gypsy moth spray zones, these individuals pursued an unsuccessful lawsuit in 1957 to halt USDA aerial spraying of their property (*New York Times* May 9, 1957:1). We have documented the coverage of this opposition (which includes the court case) by the *New York Times*; it was also the major factor leading Carson to proceed with writing *Silent Spring* (Freeman 1995; Garb 1996; Lear 1993).

Empirical examinations of the adequacy of this explanation would need to show that these individuals read the *New York Times* and were influenced by that coverage. Survey data that would allow correlating public attitudes toward pesticides with media coverage are also needed (*cf.* Gamson and Modigliani 1989). Unfortunately, given the inadequacy of the historical record, these kinds of empirical examinations are precluded for this case. In the absence of such data, the most we can claim is that the evidence we do have is in line with Kingdon's (1984) model of the agenda setting process (see also Lutts 1985 for additional factors that may have helped soften up the public in the pre-*Silent Spring* era).

In conducting our media analysis, we followed Gusfield's (1984) admonition that constructionist analysis be conducted "on the side," with the analysts' job to examine claims but not take a partisan interest in them. While we regard this as a valuable stance from which to examine controversy development, it hardly exhausts the realm of useful social scientific questions that may be asked about these events. For instance, controversy is constituted by disagreements over actual and desirable states of affairs; social scientific investigations can provide valuable insights into these issues. Work examining institutional failures, such as Freudenburg's (1993) recent introduction of the concept of recreancy, or the failure of regulatory agencies to adequately carry out publicly prescribed duties, provides one example of the kind of investigative questions relevant to the topic of pesticide practices and controversies.

To enter such an evaluative component into our own research would require asking the following question: Did the USDA adequately perform its publicly prescribed duties and obligations? Individuals interested in defending the USDA would likely conclude that the USDA's early dissemination of cautionary claims about DDT is evidence that the agency was indeed adequately "doing its job." However, whether or not our findings count as valid empirical verification of this position depends on what one initially assumes to be "the USDA's job" and what counts as "adequate" performance of it. Indeed, a person critical of USDA pesticide practices could use the findings reported in the paper to query why early USDA/SAES evidence of potentially deleterious impacts did not result in more proactive measures to protect public health and the environment.

Hajer's (1995) "story line" analysis of environmental discourse, which suggests that claims about technological risks and benefits may be presented in more complex ways than simple dichotomies, suggests one useful avenue for further exploration of these issues. A story-line, as defined by Hajer, is "a generative sort of narrative that allows actors to draw upon various discursive categories to give meaning to specific physical or social phenomenon. The key functions of story-lines is that they suggest unity in the bewildering variety of separate discursive component parts of [environmental problems]" (1995:56).

The development of compelling story lines may be one way pesticide supporters can simultaneously acknowledge and neutralize risks. Our argument that it was in the USDA's and the SAES's pragmatic interest to identify potential deleterious effects of pesticides, even in the general context of enthusiastic support, provides one indication that cautionary calls to "proper use" may present risks while deflecting more negative assessments of a technology. Future research needs to examine the extent to which pesticide supporters adhere to a common story line over the course of a controversy.

While the present analysis hardly answers all pertinent questions about U.S. pesticide controversies, the potential contributions of the concepts "routinized monitoring mechanisms" and "softening up" to understanding these events should not be understated. If the analysis we present with respect to the first concept is correct, it suggests the ironic possibility that the USDA unintentionally facilitated the development of a controversy in which it soon became a major target of criticism. If our analysis of the second concept is valid, it suggests that *Silent Spring* may represent more of an acceleration point than a turning point. That the USDA presented warnings about potential risks in a cautionary manner hardly precludes their contribution to the softening up process. From the perspec-

tive of Kingdon's (1984) agenda setting model, the pertinent point is that Carson's *Silent Spring* did not constitute the first time the public was exposed to the idea that use of synthetic organic pesticides such as DDT might produce unintended, deleterious side effects.

We close by considering the implications of this second point for assessments of public response to claims about technological hazards. If technological controversies are indeed preceded by a "softening up" period, this may serve as a partial counter to some tendencies to portray public concern over risks posed by technological hazards in the wake of increased media scrutiny as "irrational" (Goldstein 1990). When events such as the publication of *Silent Spring* or the partial core meltdown at the Three Mile Island nuclear reactor are seen to "come out of the blue," it is easier to contend that the public is responding to emotion, hype, sensational media coverage, or anything but a reasoned calculation of risks. When analyses such as this one demonstrate that the public was exposed to knowledge about potential risks long before these dramatic episodes, the proposition that public sentiments are the result of longer-term reflections on an issue becomes more tenable.

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